SURFACE VELOCITY MEASUREMENT IN THE BALTIC SEA WITH TANDEM-X: RESULTS FROM THE HGF-EDA STUDY

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Abstract

The ocean surface boundary layer constitutes the interface between the atmosphere and the deep ocean. Correct estimation of the fluxes between ocean and atmosphere is strongly influenced by surface currents and waves. It is therefore important to consider these effects in ocean circulation or coupled atmosphere-ocean models which are also used for climate studies. It has been demonstrated that sea surface velocities can be mapped for large areas and with high sensitivity by space borne SAR Along-track interferometry (ATI), e.g. in [Romeiser et al. 2014, Suchandt et al. 2015]. In this study, we utilize TanDEM-X to extract information on ocean surface processes. The satellite formation provides a unique testbed for oceanography with SAR-ATI. Within several campaigns, we have acquired bi-static interferometric data in the Baltic Sea. It serves as a pilot study area, where different kinds of reference data are available. A surface current extraction processor has been developed that derives surface velocity maps from TanDEM-X CoSSC datasets. We cross-compare these velocities to data from a numerical circulation model of the Baltic Sea as well as to in-situ measurements with the aim of geophysical interpretation. Comparison of the TanDEM-X derived velocity maps to surface currents from the Baltic Sea Ice Ocean Model (BSIOM) shows good qualitative agreement. Remaining differences are due to the influence of wave motion. To distinguish between different contributions to the observed Doppler velocities, this influence must be quantified and compensated through suitable wind field information. We demonstrate how high-resolution wind data can be extracted from the normalized radar cross section (NRCS) of the same TanDEM-X data that are used for surface velocity

measurement [Pleskachevsky et al. 2016]. This way, the often high spatial variability of the wind/wave influence on Doppler velocities can be estimated and accounted for. By this approach, different information layers of the CoSSC data are beneficially combined. It shows how new SAR oceanographic data products can evolve from TanDEM-X and also from follow-on missions like TanDEM-L.

References

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